

CLAIMS

What is claimed is:

1. An audio digital watermark apparatus for recording watermark data on a voice-recording
5 medium, which comprises:
 - an audio data acquisition unit, which acquires audio data;
 - a watermark data acquisition unit, which acquires watermark data;
 - a data generation unit for generating data for a watermark, which generates data for
generating a watermark by multiplexing the audio data acquired by said audio data
10 acquisition unit and the data for generating a watermark generated by said data generation
unit for generating data for a watermark, wherein the result of a predetermined summation of
multiplexed audio data per predetermined cycle represents the watermark data acquired by
said watermark data acquisition unit; and
 - a multiplexed audio data generation unit, which generates multiplexed audio data by
15 multiplexing the audio data acquired by said audio data acquisition unit and the data for
generating a watermark generated by said data generation unit for generating data for a
watermark.
2. The audio digital watermark apparatus according to Claim 1, wherein said data generation
20 unit for generating data for a watermark generates the data for a watermark of inaudible low
frequency.
3. The audio digital watermark apparatus according to Claims 1 or 2, wherein said data
generation unit for generating data for a watermark generates the data for a watermark, in
25 which the value and the slope of the boundary for changing the amplitude of a function of the
data for generating a watermark, which is generated by the data generation unit for
generating data for a watermark, are always zero.
4. The audio digital watermark apparatus according to any one of Claims 1 to 3, wherein said

data generation unit for generating data for a watermark correspondingly changes the amplitude of a function represented by said data for generating a watermark per half-cycle so that said result of the predetermined summation per said predetermined cycle represents the watermark data acquired by said watermark data acquisition unit.

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5. The audio digital watermark apparatus according to any one of Claims 1 to 4, wherein said result of the predetermined summation per said predetermined cycle is a sign of summation of said multiplexed audio data per half-cycle of said data for generating a watermark.

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6. The audio digital watermark apparatus according to any one of Claim 1 to 4, wherein said result of the predetermined summation per said predetermined cycle is a sign representing the difference between the summation of said multiplexed audio data corresponding to the first-half cycle of the data for generating a watermark and the summation of said multiplexed audio data corresponding to the latter-half cycle of the data for generating a watermark.

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7. An audio digital watermark decoding apparatus for decoding a watermark data recorded on an audio recording medium, which comprises:

a multiplexed audio data acquisition unit, which acquires multiplexed audio data,

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a summation computation unit, which computes the result of a predetermined summation of multiplexed audio data per said predetermined cycle, wherein said multiplexed audio data is acquired by the multiplexed audio data acquisition unit, and

a watermark data decoding unit, which decodes said watermark data based on said result of a predetermined summation computed by said summation computation unit.

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8. The audio digital watermark decoding apparatus according to Claim 7, wherein said summation computation unit computes a sign of a summation of said multiplexed audio data over a period of a half-cycle of said data for generating a watermark, in which said multiplexed audio data is acquired by the multiplexed audio data acquisition unit.

9. The audio digital watermark decoding apparatus according to Claim 7, wherein said summation computation unit computes a sign of the difference between a summation of said multiplexed audio data over a period of a half-cycle, the first half of one cycle, and a
 5 summation of said multiplexed audio data over a period of a half-cycle, the latter half thereof, in which said multiplexed audio data is acquired by said multiplexed audio data acquisition unit.

10. An audio digital watermark recording method for recording watermark data on a voice-
 10 recording medium, which comprises:

- an audio data acquisition step of acquiring audio data;
- a watermark data acquisition step of acquiring watermark data;
- a data generation step for generating data for a watermark, which generates data for a
 watermark by multiplexing the audio data acquired by said audio data acquisition step and
 15 the data for generating a watermark generated by said data generation step for generating data for a watermark, wherein a result of a predetermined summation of multiplexed audio data per predetermined cycle represents the watermark data acquired by said watermark data acquisition step; and

- a multiplexed audio data generation step, which generates multiplexed audio data by
 20 multiplexing the audio data acquired by said audio data acquisition step and the data for generating a watermark generated by said data generation step for generating data for a watermark.

11. The audio digital watermark recording method according to Claim 10, wherein said data
 25 generation step for generating data for a watermark generates the data for a watermark of inaudible low frequency.

12. The audio digital watermark recording method according to Claim 10 or 11, wherein said data generation step for generating data for a watermark generates the data for a watermark,

in which the value and the slope of the boundary for changing the amplitude of a function of the data for generating a watermark, which is generated by the data generation step for generating data for a watermark, are always zero.

- 5 13. The audio digital watermark recording method according to any one of Claims 10 to 12, wherein said data generation step for generating data for a watermark correspondingly changes the amplitude of a function represented by said data for generating a watermark per half-cycle so that said result of the predetermined summation per said predetermined cycle represents the watermark data acquired by said watermark data acquisition step.

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14. The audio digital watermark recording method according to any one of Claims 10 to 13, wherein said result of the predetermined summation per said predetermined cycle is a sign of summation of said multiplexed audio data per half-cycle of said data for generating a watermark.

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15. The audio digital watermark recording method according to any one of Claims 10 to 13, wherein said result of the predetermined summation per said predetermined cycle is a sign representing the difference between the summation of said multiplexed audio data corresponding to the first-half cycle of the data for generating a watermark and the
20 summation of said multiplexed audio data corresponding to the latter-half cycle of the data for generating a watermark.

16. An audio digital watermark decoding method for decoding a watermark data recorded on an audio recording medium, which comprises:

- 25 a multiplexed audio data acquisition step of acquiring multiplexed audio data,

 a summation computation step of computing the result of a predetermined summation of multiplexed audio data per said predetermined cycle, wherein said multiplexed audio data is acquired by the multiplexed audio data acquisition step, and

a watermark data decoding step of decoding said watermark data based on said result of a predetermined summation computed by said summation computation step.

17. The audio digital watermark decoding method according to Claim 16, wherein said
5 summation computation step computes a sign of a summation of said multiplexed audio data over a period of half-cycle of said data for generating a watermark, in which said multiplexed audio data is acquired by the multiplexed audio data acquisition step.

18. The audio digital watermark decoding method according to Claim 16, wherein said
10 summation computation step computes a sign of the difference between a summation of said multiplexed audio data over a period of a half-cycle, the first half of one cycle, and a summation of said multiplexed audio data over a period of a half-cycle, the latter half thereof, in which said multiplexed audio data is acquired by said multiplexed audio data acquisition
step.

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